

must be made for its development to the utmost. It is only by the introduction of these principles into the field of practical politics that the resources of the Empire can be fully developed, and we shall be able to hold our own against the competition of other countries, or maintain that supremacy which was obtained under entirely different conditions by rule-of-thumb methods and speculation.

Mr. Henderson, the President of the Board of Education, referred to the changing conditions, and the need for reform, in his speech in presenting the Education Estimates to the House of Commons on July 18. In the course of his remarks he said:

The war is assisting in the creation of a greater body of public opinion in favour of a more liberal expenditure on education; and the essential importance of a comprehensive and efficient system of education on the progressive development of national life and the solidifying of the Empire is going to be more universally recognised. This principle must be encouraged and fostered, and on no account should the nation, in consequence of its expenditure on the war, be detained from bringing it into action.

The Government has decided to appoint committees to reorganise our whole system of education, and one of these committees will be concerned with the position of science. British educational endeavour has too often proved unproductive because of its haphazard character and its control by men out of touch with modern needs. A classical education at one of the fashionable public schools, followed by something very similar at an ancient university, accompanied probably by the pursuit of some branch of athletics and almost certainly by a continuous neglect of all branches of science, is the typical training of our statesmen and administrators. It is impossible for these men to know what scientific teaching means to the nation, or to understand the real difference between it and purely literary studies. Book-learning may be ornamental to the individual, but it is not of much practical value to a progressive community and is a danger when it prevents attention to scientific things. None of us wish the training of character to be disregarded in education, nor do we desire to depreciate the influence of literature, art, philosophy, and religion. But we have to safeguard our existence both in peace and war, and scientific knowledge is necessary to ensure this aim. The Empire is awake to the need for a policy which will correlate education, science, and industrialism for the benefit of all classes: if our statesmen do not respond to the call to action we hope that a new party of reform will arise to drive them into the wilderness.

NO. 2439, VOL. 97]

SCIENCE FOR LIFE.

Discovery; or, The Spirit and Service of Science.
By R. A. Gregory. Pp. x+340. (London: Macmillan and Co., Ltd., 1916.) Price 5s. net.

THIS book is the realisation of a long-cherished project, "une pensée de la jeunesse exécutée par l'âge mûr," its ambition being to make clear what science—and natural science in particular—aims at, what its human values are, and what spirit characterises the discoverer. We think that Mr. Gregory has done notable service in submitting his apologia at the present time, when the disposition to turn with expectation to science is probably more widespread than ever in the past, and we would congratulate him on the success with which he has stated his case. For while he hides no convictions, he has written temperately and good-humouredly, with such wealth of concrete and personal illustration that there is no hint of sermonising to offend. Perhaps the only passage in the book which betrays a trace of impatience—and we are not surprised—is one in which the author speaks his mind in regard to politicians. But it is all "good hunting," and the politicians will not wince at worse.

We admire greatly the restrained enthusiasm with which Mr. Gregory writes of the advancement of natural knowledge and of the great masters who have contributed to this, and the carefulness with which he gives chapter and verse from the history of science, so that even a prejudiced reader cannot but be impressed. Contributing greatly to the pleasant temper of the book is the author's evident sympathy with humanistic as well as scientific studies, and his clear recognition that if an antithesis is made there is something wrong either with the science or the humanism. It is ours to warm both hands at the fire of life.

Mr. Gregory is quite clear that scientific work is not confined to any particular body of facts or to any number of laboratories. As Clifford said, "there are no scientific subjects. The subject of science is the human universe—that is to say, everything that is, or has been, or may be related to man." "The work of science," Ruskin said, "is to substitute facts for appearances and demonstrations for impressions." These quotations are taken from a very interesting series (not of uniform value, we must confess), which occur as a sort of intellectual *hors d'œuvre* at the beginning of each of the twelve chapters.

"La République n'a pas besoin de savants," coldly remarked the president of the tribunal of French Revolutionists which condemned Lavoisier to death in 1793, and a "crime against the whole intellectual world" was perpetrated. In such measure as science is wilfully neglected and discoverers are starved or smothered in toil, civilisation remains impenitent, and it is part of the merit of this book that it presses the charge home. The fine chapter on "The Conquest of Disease" illustrates one side of the debt that humanity owes to science, and not less eloquent chapters on

"Scientific Motive" and "Practical Purpose" are very convincing. "Savoir c'est prévoir; prévoir c'est pourvoir." But there is no bowing in the house of utilitarianism, for the author takes such wonders of the modern world as wireless telegraphy, the telephone, the aeroplane, radium, antiseptics and antitoxins, spectrum analysis and X-rays, and shows most circumstantially that "each one of these things had its foundations in purely scientific work, and was not the result of deliberate intention to make something of service to humanity." In this connection we confess to being staggered by a remarkable quotation from the late Prof. W. K. Brooks; we like better one from Prof. A. N. Whitehead that "it is no paradox to say that in our most theoretical moods we may be nearest to our most practical applications."

In the very first volume of *NATURE* a strong plea was made on behalf of scientific discipline, and from time to time since powerful voices have urged upon the nation the imperativeness of paying more heed to the advancement and application of natural knowledge and to the cultivation of the scouting intelligence. Much has been done which it would be inaccurate and ungrateful to ignore, but still the people perish in thousands for lack of knowledge, and science, as Mr. Gregory says, is still too much the Cinderella in the house of education. It is valuable, therefore, that we should have in this book a judicial and factual statement showing not merely that natural science has given great gifts to mankind and put into our hands the keys to many doors, but that the mastery of some of its methods and the understanding of some of its principles are in themselves an educative discipline that cannot be attained in any other way whatsoever. We are glad that the author has gone a step further in insisting on the ethical value of learning to be a respecter of things and of habituating oneself to a high standard of accuracy.

In his references to the life and work of men like Galileo, Newton, Faraday, Darwin, Huxley, Kelvin, and Pasteur, the author illustrates the spirit of the discoverer—his fanaticism for the sanctity of truth, his disinterestedness and impersonal detachment, his delight in his work, and his cautious yet alert recognition of the possibility of error. As we read of the masters we feel a freshened conviction of the value of studies—far too rarely prosecuted—in the history of science. Much of the book is an eloquent commentary on the text: "The future of our civilisation depends upon the widening spread and deepening hold of the scientific habit of mind." And since the happiness of a people depends not a little on their capacity for the profitable enjoyment of leisure, we welcome the author's insistence on the inexhaustible delights of what our fathers called the pursuit of knowledge. It is man's prerogative to try to know Nature increasingly well, and it is certain that in proportion to his sincerity in this endeavour will be his enjoyment of her acquaintance.

Mr. Gregory has been well advised to dwell at
NO. 2439, VOL. 97]

considerable length on certain illustrations of the moods and methods of the discoverer, for the reader thus gets adequate concrete material on which to base an appreciation of his own. This greatly increases the value of the book. It has been quizzingly said that "the man of science appears to be the only man in the world who has something to say, and he is the only man who does not know how to say it." It is unnecessary to mention that Mr. Gregory, at any rate, must be exempted from this reproach, for his style is luminous and refreshing. We find, indeed, but one blemish in his work—that he does not tackle with sufficient directness the very interesting problem of the different kinds of discoverer, for there are certainly several distinct species which it would be profitable to have discriminated.

J. ARTHUR THOMSON.

MATHEMATICAL TEXT-BOOKS.

- (1) *Arithmetic*. Part i. By F. W. Dobbs and H. K. Marsden. Pp. xv+353. (London: G. Bell and Sons, Ltd., 1915.) Price 3s.
- (2) *First-year Mathematics for Secondary Schools*. By E. R. Breslich. Fourth edition. Pp. xxiv+344. (Chicago: The University of Chicago Press; London: Cambridge University Press, 1915.) Price 4s. net.
- (3) *Mathematics for Machinists*. By R. W. Burnham. Pp. viii+229. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1915.) Price 5s. 6d. net.
- (4) *A First Course of Geometry*. By Dr. C. Davison. Pp. 89. (Cambridge: At the University Press, 1915.) Price 1s. 6d.

(1) **T**HIS text-book consists chiefly of sets of examples and test-papers, with some typical solutions. Detailed explanations are left to each teacher to give as he thinks fit. This has the double advantage of keeping the book within reasonable compass and at the same time including as much as any boy is likely to require, for boys do not, and probably never will, read long discussions in the text. But when revising or doing out-of-school work a certain number of specimen solutions are of real use. We like the general appearance of the book; there are numerous interesting and attractive questions, those on contours and map-reading deserving special mention.

(2) The author has drawn up a continuous course of algebra, geometry, and very simple trigonometry, suitable for a first reading. He claims that the fusion of these subjects in a single volume increases the interest of the students, enriches the content of the teaching syllabus, and emphasises the relation between the different subjects. The geometry includes simple properties of parallelism, congruence, tangency, and similarity; the algebra goes up to factors and quadratic equations. The book is printed in a most attractive form, and there are a number of excellent portraits of famous mathematicians, with interesting historical notes attached.

(3) The author of this volume has had consider-